CLAIMS

1. A rotor for a wind turbine comprising a plurality of radial blades and a ring-shaped aerofoil diffuser connecting the outer tips of the blades.

2. A rotor according to claim 1, wherein the aerofoil diffuser extends downstream from the outer tips of the blades.

3. A rotor according to either preceding claim, wherein the outer tips of the blades are connected to the diffuser at or near to the leading edge of the diffuser.

4. A rotor according to any preceding claim, wherein the aerofoil diffuser tapers outwards from the outer tips of the blades to form a substantially frusto-conical diffuser.

the rotational axis of the frusto-conical diffuser is substantially aligned to the rotational axis of the blades.

5. A rotor according to claim 1, wherein at least a portion of the aerofoil diffuser extends upstream from the outer tips of the blades.

6. A rotor according to any preceding claim, wherein the aerofoil diffuser tapers radially outwards as it extends from the upstream end to the downstream end.

7. A rotor according to any preceding claim, wherein the aerofoil diffuser is shaped such that it inhibits the partly axial and partly radial airflow from the blades, said airflow becoming circumferential when it contacts the aerofoil diffuser.

8. A rotor according to any preceding claim, wherein the aerofoil diffuser is adapted to inhibit partly axial and partly radial airflow from the outer tips of the blades and divert said airflow to substantially circumferential airflow during normal operation.

9. A rotor according to any preceding claim, wherein the blades are inclined at an angle relative to a transverse rotor plane perpendicular to the rotational axis of the rotor.

10. A rotor according to claim 9, wherein the angle of inclination may vary along the length of the blade.

11. A rotor according to claim 9 or claim 10, wherein the angle of inclination of each blade is greater at an intermediate portion of the blade than at the outer tip of the blade.

12. A rotor according to any preceding claim, wherein the blades are substantially parallel to the transverse rotor plane at the outer tip of the blades.

13. A wind turbine comprising a rotor according to claims 1 to 12, further comprising a nacelle and a mounting means adapted to allow rotation of the turbine and rotor about a directional axis perpendicular to the rotational axis, thus allowing the turbine to be oriented in the optimum direction depending on wind conditions.

14. A wind turbine according to claim 13, further comprising a furling means adapted to rotate the rotor about the directional axis so that the rotational axis is not parallel to the direction of airflow when the airflow speed is greater than a predetermined airflow speed.

15. A wind turbine according to claim 14, wherein the furling means comprises a non-linear furling means adapted to provide no furling over a first lower range of airflow speed and a varying degree of furling over a second higher range of airflow speed.

16. A wind turbine according to claims 14 and 15, wherein the furling means comprises at least two tail fins extending downstream of the diffuser.

17. A wind turbine according to claim 16, wherein the two tail fins are provided diametrically opposite each other.

18. A wind turbine according to claim 16 or 17, wherein one of the tail fins is a moveable tail fin

hingedly mounted for rotation about a tangential hinge line.

19. A wind turbine according to claim 18, wherein the moveable tail fin may be mounted on a mounting boom and the hinge line may be provided: at the connection point of the mounting boom and the nacelle, so that the mounting boom also rotates; at the connection between the mounting boom and the moveable tail fin so that only the moveable tail fin rotates; or at any point along the length of the mounting boom.

20. A wind turbine according to claims 18 or 19, wherein the tail fin rotates about a horizontal axis under high winds resulting in a fin which folds about a horizontal axis.

21. A wind turbine according to claims 18 to 20, wherein the moveable tail fin is rotationally biased by biasing means to an at-rest position in which the leading edge of the moveable tail fin is closer to the axis of rotation of the rotor than the trailing edge of the moveable tail fin, such that the moveable tail fin is angled at an at-rest attack angle to the axis of rotation of the rotor.

22. A wind turbine according to claim 21, wherein the biasing means is non-linear.

23. A wind turbine according to claim 21 or 22, wherein the biasing means is adapted to hold the

moveable tail fin in the at-rest position until the airflow speed reaches a predetermined speed and is further adapted such that as the airflow speed increases beyond the predetermined speed the moveable fin rotates and the attack angle decreases, resulting in unbalanced aerodynamic loading on the wind turbine, such that the wind turbine rotates about its mounting axis to a furled position.

24. A wind turbine system comprising:

a wind turbine driven generator and means for providing a power output.

25. A wind turbine system according to claim 24, wherein the system further comprises an electronic control system.

26. A wind turbine system according to claim 24 or 25, wherein the system comprises a dump element comprising one or more energy dissipaters.

27. A wind turbine system according to claim 26, wherein the energy dissipaters are in the form of resistive elements.

28. A wind turbine system according to claims 26 or 27, wherein the dump element is in the form of a liquid storage vessel having electrical heating elements therein adapted to heat liquid in said storage vessel.

29. A wind turbine system according to claim 28, wherein the control system may be adapted to supply electrical power to said one or more electrical heating elements when the power from the wind exceeds a predetermined power.

30. A wind turbine system according to claim 28 or 29, wherein the liquid storage vessel is a cold water tank and the liquid is water.

31. A wind turbine system according to claim 28 or 29, wherein the heating element is a radiator.

32. A wind turbine system according to claim 26, wherein the dump element is activated by the electronic control system when the power available from the wind exceeds the power take-off due to a loss or reduction of electrical load caused by the switching off, reduction or separation of the said electrical load.

33. A wind turbine system according to claim 32, wherein the dump element is activated when the rotor speed increases above a defined "dump on" rotor speed caused by the imbalance of wind turbine rotor torque and wind turbine generator torque, said wind turbine rotor torque being dependent on wind speed and the said wind turbine generator torque being dependent on the electrical load.

34. A wind turbine system according to claim 33, wherein said dump element is adapted to increase the

wind turbine generator torque above the wind turbine rotor torque reducing the wind turbine rotor speed until it approaches or reaches a stall and is further adapted such that the generator torque is released when the wind turbine rotor speed falls below a defined "dump off" rotor speed, the said "dump on" and "dump off" rotor speeds being defined proportionally to the power take-off.

35. A wind turbine system according to claims 24 to 34, wherein the wind turbine system is provided with a control means adapted to control the level of power taken from the wind turbine.

36. A wind turbine system according to claim 35, wherein the control system is adapted to increase or decrease the power take-off from the wind turbine by a small amount relative to the total power take-off.

37. A wind turbine system according to claims 24 to 36, wherein the system comprises a wind turbine according to claims 1 to 23.

38. A wind turbine system according to claims 24 to 37, wherein the power output is connected to a heating system further comprising a further liquid storage vessel,

one or more electrical heating elements adapted to heat liquid in said further vessel, and

control means adapted to control the supply of electricity generated by said generator to said one or more electrical heating elements.

38. A wind turbine system according to claim 37, wherein the further liquid storage vessel is a hot water tank and the liquid is water.

39. A wind turbine system according to claim 38, wherein the heating system comprises a plurality of electrical heating elements, and the control means is adapted to supply electrical power to a proportion of the electrical heating elements, the proportion being dependent upon the instantaneous electrical power generated by the generator.

40. A wind turbine system according to claim 39, wherein the heating element in the further liquid vessel is enclosed by means of a tube, open on the underside thereof and adapted to allow water to flow from beneath the tube towards the heating element.

41. A wind turbine system according to claim 40, wherein the tube encloses and extends over the entire length of the heating element such that the water near the heating element is heated and will flow upwards due to natural convection, the tube being adapted to enable the formation of different and separate heat zones within the further liquid storage vessel.

42. A wind turbine system according to claims 24 to 41, wherein the power output is connected to a grid-tie inverter or stand alone inverter.

43. A wind turbine system according to claim 42, wherein the inverter is adapted to supply power to local or grid power infrastructure.

44. A wind turbine system according to claims 24 to 43, wherein the power output is connected to an energy storage system.

45. A method of controlling the level of power taken from a wind turbine comprising the following steps taken by a control means:

(a) increasing or decreasing the power take-off from the wind turbine by a small amount;
(b) temporarily setting the level of power take -off;
(c) after a predetermined time period, taking a number of measurements of the rotor speed;
(d) calculating the first, second and third order values, namely speed, acceleration/deceleration and rate of change of acceleration/deceleration respectively, to the said increase or decrease in power take-off;
(e) adjusting the power taken from the wind turbine in response to the calculation.

46. A method according to claim 45, wherein the control means uses the following logic to determine the adjustment:

(a) IF: there is a positive second order rotor speed response (acceleration) and an increasing rate of said acceleration

(positive third order response) of the rotor speed; THEN: the control means causes an increase in the power take-off; OR

(b) IF: there is a positive second order rotor speed response (acceleration) and decreasing rate of said acceleration (negative third order response) of the rotor speed; THEN: the control means causes an increase or alternatively no change in the power take-off; OR

(c) IF: there is a negative second order rotor speed response (deceleration) and increasing rate of said deceleration (positive third order response) of the rotor speed; THEN: the control means causes a reduction in the power take-off; OR

(d) IF: there is a negative second order rotor speed response (deceleration) and decreasing rate of said deceleration (negative third order response) of the rotor speed; THEN: the control means causes an increase or alternatively no change in the power take-off.

47. A method according to claim 45 or 46, wherein the control means repeats any of the above steps to continue adjusting the power take-off to ensure that the power take-off is always maximised to the power available to the wind turbine which is dependent on the local wind speed at the rotor plane.

48. A wind turbine according to claims 13 to 23 comprising means for reducing the operating vibrations caused by harmonic resonance within the turbine, tower and mounting structure.

49. A wind turbine according to claim 48, wherein the wind turbine is provided with a nacelle damping system, adapted to at least partially isolate the vibrations in the generator and turbine from the tower.

50. A wind turbine according to claim 48 or 49, wherein the wind turbine is provided with mounting brackets for mounting the turbine on a surface, the brackets having a sandwich construction of visco-elastic materials and structural materials.

51. A wind turbine according to claims 48 to 50, wherein the mounting means is tubular.

52. A wind turbine according to claim 50, wherein the tower contains one or more cores of flexible material, such as rubber, with sections with a reduced diameter, which are not in contact with the tower's inner radial surface, such that the reduced diameter sections alternate with normal sized sections, which are in contact with the tower's inner surface thus serving to absorb vibrations in the tower through the energy dissipated in the flexible core before they reach the mounting brackets.

53. A wind turbine according to claim 52, wherein the rubber core is adapted to control the system's resonant frequency out-with the turbine driving frequency by absorption of a range of vibration frequencies.

54. A wind turbine according to claim 53, wherein the cross-sectional shape and length of each of the reduced diameter sections is altered thus "tuning" the system to remove a range of vibration frequencies from the mounting structure.

55. A wind turbine according to claims 48 to 54, wherein the sandwich mounting brackets compliment the mounting means core design and suppress vibrations that come from the nacelle.

56. A wind turbine according to claim 55, wherein the nacelle supports the generator through bushes designed to eliminate vibration frequencies.